Racial Inequalities in Forbearance and Refinancing Among Low-Income Homeowners During COVID-19

Research Thesis

Presented in partial fulfillment of the requirements for graduation *with research distinction* in the undergraduate colleges of The Ohio State University

by

Katie Visalli

The Ohio State University
April 2021

Project Advisors: Professor Stephanie Moulton, John Glenn College of Public Affairs and Professor Vladimir Kogan, Department of Political Science

I: Introduction

Many Americans experienced a loss of income due to the COVID-19 pandemic. The sudden income shock had the most drastic immediate effect on lower-income households and people of color (Parker, 2020; Lee, et al., 2021). As of December 2020, there were about 3.2 million homeowners struggling to pay their monthly bills (Choi & Pang, 2020). For people who own homes, their mortgage is often the largest monthly expense. Homeowners who cannot make their mortgage payments may eventually face foreclosure. Stopping foreclosures is important not only to keep families in their homes, but because foreclosures have negative externalities for communities including increased crime, decreasing neighboring property values, and eventually more foreclosures (Chan, et al., 2014).

The Coronavirus Aid Relief and Economic Security Act (CARES), passed by Congress to assist Americans facing sudden and drastic income loss, provides distressed homeowners with a temporary break from making mortgage payments. Forbearance is a temporary halt of mandatory payments, with the missed payments repaid or restructured at the end of the forbearance period.[1] Under the CARES Act, any homeowner with a federally insured mortgage may request a halt on payments for 180 days (6 months), which can be extended up to 18 months (Consumer Financial Protection bureau, 2021). Private lenders of loans that are not federally insured may choose to offer forbearance, and at the beginning of the COVID pandemic in April 2020, 9 percent of all mortgages were in forbearance (Farrell, et al., 2020). However, not all homeowners experiencing financial distress had their mortgages in forbearance. Research by

[1] The missed monthly payments during a forbearance are either due as a lump sum at the end of the forbearance period, paid back by increasing the next few monthly payments made, or tacked on at the end of the loan. Financial institutions with federally backed mortgages are not allowed by the CARES Act to make borrowers pay back their missed payments as a lump sum (Consumer Finance Protection Bureau, 2020). This restriction does not apply to borrowers with non-federally backed mortgages.

JPMorgan Chase found that 2% of their active borrowers were missing payments and not in forbearance (Farrell, et al., 2020). Some of these borrowers may be people who did not qualify for forbearance because their financial hardship started before the pandemic and was unrelated to the crisis. However, others may be people who were simply unaware of forbearance options. Survey evidence from Fannie Mae suggests that Black and Hispanic borrowers may appear disproportionately in the group of homeowners who are not in forbearance because they are not aware that it is an option; 65% of Hispanic, 51% of Black and 41% of white respondents were not familiar with mortgage relief options (Duncan, 2020).

During the COVID pandemic, interest rates also dropped to historic lows, making refinancing a smart option for many homeowners (Freddie Mac, 2021). By refinancing a mortgage at a lower interest rate, homeowners may be able to reduce their monthly mortgage payments and reduce the amount of time it takes to repay their loan. However, not all homeowners take advantage of record low interest rates. Common barriers to refinancing include unemployment, inability to cover closing costs, low credit scores, and delinquency, which are more common amongst low-income and minority homeowners (Keys, et al, 2016; DeFusco & Mondragon, 2020).

It is important to understand the barriers to forbearance and refinancing during the COVID-19 pandemic, and how to make financially optimal options more accessible. There is concern that disparate take-up of forbearance and refinancing options will exacerbate existing inequities in homeownership, particularly for Black and Hispanic homeowners. Preliminary research shows that the pandemic is likely to cause worse mortgage outcomes for Black and Hispanic homeowners than for white homeowners (Cornelissen & Herman, 2020; Cohen, 2020). According to the Fannie Mae National Housing Survey from June 2020, 53% of Hispanic and

42% of Black respondents were worried about being able to pay their monthly bills, significantly more than the 26% of white respondents who were worried (Duncan, 2020). Therefore, it is vital to know what factors predict the use of different mortgage options for low-income homeowners during the COVID-19 pandemic and whether they vary by race.

In this paper, I use data from the Ohio Housing Finance Agency (OHFA)'s first time homeowner program to determine which factors predict the use of different mortgage options for low and moderate income (LMI) homeowners during the COVID-19 pandemic and whether the predictive power of these factors varies by race. LMI homeowners are of particular interest because prior research has shown that lower income homeowners are less likely than higher income homeowners to be aware of their options and make financially optimal decisions (Bucks & Pence, 2008; Bhutta et al., 2020). The OHFA affordable loan product studied in this paper holds constant mortgage characteristics such as interest rate, securitization, and servicer that typically vary between borrowers, and which may be difficult to otherwise observe, creating omitted variable bias which is not present in this study. This is important because previous studies have found that these factors affect whether borrowers take up mortgage assistance programs or refinance their loans (Lambie-Hanson & Reid, 2018; Collins, et al., 2011).

I model the competing and mutually exclusive mortgage outcomes using multinomial logistic regressions. I find that Black homeowners were more likely default before the onset of the COVID-19 pandemic, then more likely to opt into forbearance and less likely to refinance than white homeowners after the onset of the pandemic. There are several other variables that follow the same pattern as the difference in outcomes between Black and white borrowers. These variables can be used to predict which borrowers will be more likely to default after forbearance is over. This paper does not identify the reasons for higher rates of forbearance among Black

homeowners, or reasons for lower rates of refinancing. Future research should consider the extent to which this is driven by racial disparities in the probability of experiencing an income loss due to the COVID-19 pandemic.

II: Expectations

In this section, I briefly summarize prior literature that informs my expectations for the factors that influence the take-up of forbearance (and mortgage assistance programs more broadly) and mortgage refinancing. These are generally separate literatures, but I draw from both since they are used in this paper as competing outcomes. Both bodies of literature inform this study by showing past examples of when low-income and minority homeowners seem to make suboptimal mortgage decisions during economic downturns (Bucks & Pence, 2008; Collins, et.al., 2011; Lambie-Hanson & Reid, 2018; Bhutta & Hizmo, 2020; Eric, et. al., 2019).

Mortgage decisions are often conceptualized using an options-theoretic framework (Hembre et al., 2020). Each month, there is a set of mutually exclusive possible outcomes for a mortgage. Borrowers can stay current on their mortgage, default, or prepay. Prepaying on a mortgage signifies that the borrower refinanced or sold their home. After the 2020 CARES Act was passed, borrowers had the additional option to put their mortgage into forbearance. Borrowers are considered current while in forbearance, and thus are not in default even if they stop making payments. Financial institutions will not refinance loans in forbearance if the borrower is not making payments, but borrowers in forbearance who keep making all their payments are able to refinance (FHFA, 2020).

Borrowers may make decisions regarding their mortgages that appear to be suboptimal because of gaps in information. Homeowners with low income and education, as well as elderly

and minority homeowners are less likely to know their mortgage terms, in part because the costs of acquiring mortgage information may be higher for these populations (Bucks and Pence, 2008). A history of low homeownership rates among minority populations in the US has led to fewer minority homebuyers today with inherited knowledge about homeownership than white homebuyers (Rothstein, 2018). There is also evidence of a knowledge gap when it comes to mortgage options during the COVID-19 pandemic. A survey by Fannie Mae in June of 2020 found that 65% of Hispanic, 51% of Black and 41% of white respondents claimed they were not familiar with mortgage relief options (Duncan, 2020).

There may also financial factors that can influence mortgage decisions and correlate with the race and ethnicity of homeowners, resulting in disparities. Wealth is important for qualifying for a good loan but is usually not included in mortgage data. Financial assistance from family and friends can also make a large difference in housing outcomes. Inherited household wealth, of which Black Americans have significantly less than white Americans, increases the chance that a household will own a home (Acolin, et al., 2019). Wealth may not explain differences in take up of forbearance, but inability to cover closing costs could keep lower-income borrowers from refinancing (DeFusco & Mondragon, 2020). The extent to which these factors are not observed and included in analyses can create omitted variable bias, making it difficult to isolate the effects of race and ethnicity on mortgage outcomes.

Refinancing when interest rates drop can make mortgages more affordable for low-income and racially or ethnically marginalized homeowners (Collins & Reid, 2011). Unfortunately, these are the groups of borrowers who face the most barriers to refinancing (Lambie-Hanson & Reid, 2018). A study by Bhutta & Hizmo (2020) found that mortgage interest rates differ by race in part because Black borrowers originate loans with higher loan to

value ratios (LTV) and are less likely to pay "points" to buy down their interest rates than white borrowers, resulting in higher interest rates among Black borrowers. Collins and Reid (2011) found that loans with high LTVs have a higher chance of foreclosing, and that refinancing the loans of Black borrowers eliminates the differential rate of foreclosures between Black and white homeowners. A study by Lambie-Hanson & Reid (2018) found that homeowners with low credit scores are less likely to refinance than homeowners with high credit scores, and that Black and Hispanic borrowers are overrepresented among borrowers with low credit scores. Some of this effect is from differential access to government programs to help low-income homeowners refinance. Borrowers can only receive a federally backed mortgage if they have a credit score of at least 620, and federally backed mortgages can receive perks that private mortgages do not. For example, the Home Affordable Refinance Program (HARP) was created to help borrowers refinance their loans to in response to the 2007-08 housing market crash, but it was offered only to homeowners with federally backed mortgages (Lambie-Hanson & Reid, 2018). All the loans in this study were originated through a single affordable mortgage program, so I will be able to hold constant differences in loan type that might otherwise make it hard to isolate the effect of credit score or race.

Prior research on the use of mortgage assistance has found some variation by race, but these differences may be explained by borrower characteristics. The Home Affordable Modification Program (HAMP) was successful in modifying loans without any perceived racial discrimination, although financial characteristics certainly played a role in a borrower's likelihood of receiving mortgage relief with low-income borrowers less likely to receive modifications than middle- or high-income borrowers (Collins & Reid, 2011). Another study by Eric, et.al. (2019) found that borrowers who mistrusted financial institutions were less likely to

take up mortgage relief options offered by HARP. Because of the structure of the forbearance program under the CARES Act (e.g., available to anyone with COVID-19 related hardship), take up of forbearance should not be dependent on risk characteristics of borrowers. However, behavioral characteristics like mistrust of financial institutions or transaction costs associated with seeking assistance may play a role in the use of mortgage relief options among low-income borrowers. A study of the Ohio Hardest Hit Fund by Russell et. al. (2014) found that distance from a brick-and-mortar agency decreased the likelihood that an eligible homeowner would apply for mortgage relief. This indicates that transaction costs can create a barrier to take-up of mortgage assistance program. Compared to the state-administered Hardest Hit Fund program, transaction costs are lower for forbearance during the COVID-19 pandemic because the process occurs over the phone and required little documentation.

III: Research Setting & Data

This study uses loan level administrative data from The Ohio Housing Finance Agency (OHFA). Housing Finance Agencies (HFAs) provide affordable lending programs to low and moderate income (LMI), and often first time, homebuyers. Prior research finds that HFA borrowers default and foreclose at a lower rate than similar borrowers of private loans, in part because of affordability but also because HFAs offer additional support to borrowers through direct servicing and homeownership counselling (Hembre, et al., 2020). For this study, I focus on borrowers who purchased a home through OHFA's affordable mortgage program between 2015 and 2019, and who still had an active mortgage as of February 2020—the onset of the COVID pandemic.

To measure loan outcomes during COVID, I use monthly data on loan performance from February 1, 2020 to February 28, 2021.Origination data collected on each loan includes

financial, loan, borrower, house, and family characteristics. Loan outcome data are provided monthly, and includes mortgage payment behavior, whether a loan is in forbearance in a given month, and when a loan prepays. Zip code level data on percent urban from the 2010 census and Home Price Index (HPI) from the Federal Housing Finance Agency are also linked to the OHFA data (Untied States Census Bureau, 2019; Federal Housing Finance Agency (2), 2020).

A weakness of the dataset is that I do not know the reason that a borrower prepays on their mortgage. When borrowers prepay, they may be refinancing to lower their interest rate, take out home equity, or sell their home. It is possible that OHFA borrowers will refinance at a higher rate than borrowers of non-HFA loans when interest rates drop because counseling has been shown to increase the likelihood of a borrower refinancing when it is financially optimal to do so (Hembre, et al., 2020; Collins, et al., 2013). However, HFA borrowers generally have lower interest rates at origination, and thus the value of refinancing is likely lower for these borrowers.

V: Methodology

A mortgage can have one of four mutually exclusive possible statuses each month. They are (1) forbearance (2) prepay, (3) default (without forbearance), and (4) stay active. For this paper, default is defined as being 60 or more days late on the mortgage payment. For the purposes of the analysis, I code the status of each loan at quarterly intervals since the onset of the COVID pandemic, in February 2020, June 2020, October 2020, and February 2021. Prepayment is a terminal outcome; once a borrower enters prepayment, they cannot exit that status in future periods.

Because borrowers who continued to pay their mortgage and have federally insured loans can refinance while in forbearance due to an FHFA (2020) rule, I also look at the borrowers in

forbearance to determine if any OHFA borrowers in forbearance subsequently prepaid their loans. Difference in means tests will be used to identify statistically significant differences in homeowner characteristics between groups, including differences in the use of mortgage options by race of the homeowner.

The next step is to explain variations in use of mortgage options by race. I begin with a multinomial regression model predicting each of the four competing outcomes as of February 28, 2021, where the primary explanatory variable is the race of the homeowner. I then use a stepwise regression approach to add sets of control variables to identify characteristics that may account for (mediate) differential use of mortgage options by race. I repeat these steps, estimating regressions of the status of the loans as of June 2020, October 2020, and February 2021. A multinomial logistic regression model accounts for competing, unordered, categorical outcomes such as the four mortgage options listed above. The sum of the fraction of the population using each option is equal 1 since everyone must fall into one of the categories. The reference option is "active" as it is the most likely outcome and aligns with the status quo. The probabilities of the other options are in relation to the probability of staying active.

An important explanatory variable for refinancing is the loan's current interest rate. Normally in the literature, call option is used to determine whether it is "in the money" refinance. Since the timeframe of this study is only one year, the interest rate on the loan is a sufficient indicator of whether the borrower would benefit relative to the others if they refinanced. Race is interacted with the loan's interest rate to test if race moderates the effect of interest rate on the decision to refinance. This is an important interaction to consider because a statistically significant effect would mean that race, or a confounding variable linked to race, plays a role in whether a borrower refinances in response to having a high interest rate.

IV: Summary Statistics

Table 1: Summary Statistics

VARIABLES	N	mean	sd	min	max
Black	16,096	0.149	0.356	0	1
Hispanic	16,096	0.0265	0.161	0	1
Asian or Pacific Islander	16,096	0.0160	0.125	0	1
White	16,096	0.760	0.427	0	1
Other Race/Ethnicity	16,096	0.0474	0.213	0	1
Loan Age	16,124	26.24	15.40	1	60
CLTV	15,389	0.918	0.0880	0.236	2.039
Price of Home	15,389	134,711	50,053	22,119	388,230
Depository or Union	16,124	0.188	0.390	0	1
Annual Change in Home price	15,389	12,225	12,611	-28,015	96,363
DPA	16,124	0.819	0.385	0	1
Age	16,124	34.72	11.57	19	91
Married	16,122	0.350	0.477	0	1
Household Size	15,636	2.131	1.285	1	10
Female	16,119	0.473	0.499	0	1
Dependents to Employed	15,596	0.474	0.899	0	8
Disabled or Elderly	15,636	0.0187	0.180	0	4
Occupation Missing	16,124	0.141	0.348	0	1
Essential Worker	16,124	0.116	0.320	0	1
Medical Worker	16,124	0.110	0.312	0	1
Coborrower	16,124	0.157	0.364	0	1
Percent Urban of County	16,124	85.03	18.67	0	99.42
Age of Home	16,121	61.42	29.37	1	220
Household Income	16,124	47,529	16,509	0	109,577
Credit Score	16,107	706.1	42.69	350	850
Coborrower Credit Score	16,124	111.3	258.9	0	832

Table 1 reports the summary statistics for the variables and sample included in the regression models (Table 1: Summary Statistics). These variables are derived from both data at the time of origination and monthly loan performance. All loans included in this sample were originated since 2015 and active as of February 2020. The average borrower in the sample has a household income of around $46,000 and a credit score around 700. Just under half of the borrowers are female, and most do not have a coborrower. Just under 80% of the borrowers are

white and about 15% are Black, with 2.6%, 1.6%, and 4.7% Hispanic, Asian or Pacific Islander, and other, respectively. Because the sample of borrowers who identify as a race other than white or Black is so small, only the differences between white and Black borrowers are taken as potentially significant. The other options for race are included in the regression as controls.

V: Results

Table 2 reports a snapshot of loan outcomes for the active sample of loans as of February 2020, including options for stay current, default, and prepay because forbearance was not yet available. The February 2020 snapshot shows the state of the sample of loans directly before the onset of the COVID economic shutdown. Before COVID, Black homeowners were nearly 50% more likely to default than white homeowners at $p<0.001$ significance after controlling for other available variables (Table 2: Relative Risk Ratios of Default in February 2020).

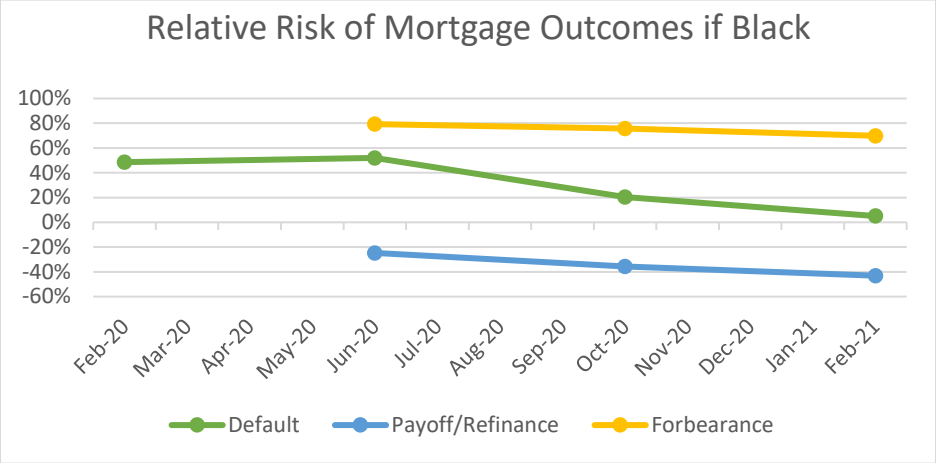
Table 3 reports the status of loan outcomes for the same sample of homeowners as of June 2020. Fortunately, the number of borrowers in default and not in forbearance dropped by about 30% from February to June after forbearance was introduced (Table 3: Relative Risk Ratios of Mortgage Options June 2020). Throughout the pandemic, the difference in the likelihood of default between Black and white borrowers was reduced until February 2021, when there was no statistically significant difference between the default rates of Black and white borrowers.

As indicated in Table 3, Black borrowers were more likely to opt into forbearance than white borrowers throughout the pandemic. Black borrowers were 78% more likely to opt into forbearance in June 2020 at $p<0.001$ significance (Table 3: Relative Risk Ratios of Mortgage Options June 2020). These results suggest that forbearance was successful in significantly

reducing defaults. There is not enough evidence to determine if Black borrowers are more or less likely than white borrowers to use forbearance dependent on whether it would be the optimal choice. To know whether information gaps or mistrust outlined in the expectations section have any racial effect, we would need to know if there is a difference in how likely Black and white borrowers are to opt into forbearance if they suffer a loss of income due to the pandemic.

Unfortunately, Black borrowers were 25% less likely in June 2020 and 43% less likely in February 2021 than white borrowers to refinance during the pandemic when market interest rates were low. The interaction of loan interest rate with race is insignificant when explaining variation in refinancing. This means that Black borrowers are no more or less responsive to their interest rate when deciding whether to refinance. Instead, this disparity is likely linked to the higher likelihood for Black borrowers to opt into forbearance. Descriptive evidence in line with this type of substitution is shown in Figure 1. Borrowers in forbearance are disqualified from refinancing if they are not also staying current their payments. Because Black borrowers were more likely to default before the pandemic than white borrowers, it stands to reason that Black borrowers were also more likely to require assistance from forbearance, and less likely to be able to continue making payments while in forbearance, which disqualifies borrowers from refinancing.

Figure 1: Relative Risk of Mortgage Outcomes if Black



As expected, there are many variables other than race that predict variation in mortgage outcomes. Some variables were consistently significant when predicting variation in default before and after the introduction of forbearance. A higher credit score and higher household income were always associated with a lower risk of default and higher risk of refinancing (Table 2: Relative Risk Ratios of Default in February 2020; Table 4: Relative Risk Ratios of Mortgage Outcomes in February 2021). After forbearance was introduced, borrowers with higher household incomes and credit scores were less likely to opt into forbearance (Table 4: Relative Risk Ratios of Mortgage Outcomes in February 2021). There were some variables which were significant predictors of default before forbearance, were significant for predicting the use of forbearance, and were associated with lower changes of refinancing. The race category of Black is only one of these characteristics that follow this pattern. Other significant characteristics include higher home prices, being a recipient of down payment assistance, older borrowers, larger families, and older homes (Table 2: Relative Risk Ratios of Default in February 2020, Table 4: Relative Risk Ratios of Mortgage Outcomes in February 2021). These variables are important to note because borrowers with these characteristics were more likely to default if they

had not used forbearance, and therefore less likely to make payments while in forbearance. This makes these borrowers less likely to be able to refinance while interest rates were low. These borrowers may also be more likely than others to go into default after leaving forbearance.

VI: Conclusions

The outstanding balance on loans in forbearance continues to grow, with interest. Permitting and encouraging refinancing for low-income homeowners in forbearance could lessen the tide of foreclosures that may occur when forbearance is over. Permitting borrowers in forbearance to refinance would also be a step towards better racial equity in the housing market as Black borrowers will be likely to leave the COVID pandemic with higher mortgage balances, higher interest rates, and greater difficulty making their mortgage payments than white borrowers. This policy recommendation is shared by the Urban Institute who cite low credit scores among low-income borrowers as a barrier to refinancing (Goodman & Golding, 2021).

While this paper offers descriptive evidence of disparities in mortgage outcomes by race, future research should include data on income shocks. This will provide insights on whether and by how much racial inequalities in unemployment lead to racial disparities in mortgage outcomes. Further investigation of differences in refinancing by race should more explicitly model differences in responsiveness to interest rates, measuring the value of refinancing for each borrower (call option). Further research could also interact the income shock and call option value with race to see if these variables have differential effects on mortgage outcomes by race.

Bibliography

Acolin, A., Lin, D., & Wachter, S. M. (2019). “Endowments and minority homeownership”. *Cityscape*, 21(1), 5-62.

Beraja, Martin, Andreas Fuster, Erik Hurst, and Joseph Vavra. (2019). "Regional Heterogeneity and the Refinancing Channel of Monetary Policy." The Quarterly Journal of Economics 134 (1): 109–183.

Bucks, B., & Pence, K. (2008). “Do borrowers know their mortgage terms?”. *Journal of urban Economics*, 64(2), 218-233.

Bhutta, Neil and Hizmo, Aurel,. (January 31, 2020). “Do Minorities Pay More for Mortgages?”. FEDS Working Paper No. 2020-007 https://doi.org/10.17016/FEDS.2020.007.

Bhutta, Neil, and Benjamin J. Keys. (2016). "Interest rates and equity extraction during the housing boom." American Economic Review 106 (7): 1742-74.

Chan, S., Sharygin, C., Been, V., & Haughwout, A. (2014). “Pathways after default: What happens to distressed mortgage borrowers and their homes?”. *The Journal of Real Estate Finance and Economics*, 48(2), 342-379.

Cherry, S.F., Jiang, E.X., Matvos, G., Piskorski, T., & Seru, A. (2021). “Government and Private Household Debt Relief During Covid-19”. National Bureau of Economic Research Working Paper 28357. Accessed at: http://www.nber.org/papers/w28357

Choi, J. H., Pang, D. (2020) “Three Ways to Help 3.2 Million Struggling Homeowners”. *Urban Institute*. Accessed at: https://www.urban.org/urban-wire/three-ways-help-32-million-struggling-homeowners

Cohen, Alys. (2020). “A Looming Crisis: Black Communities at Greatest Risk of COVID-19 Foreclosure”. *National Consumer Law Center*. Available at: https://www.nclc.org/images/pdf/special_projects/covid-19/IB_Covid_Black_Forbearance_Foreclosure.pdf

Collins, J. Michael and Reid, Carolina Katz. (January 18, 2011). “Who Receives a Mortgage Modification? Race and Income Differentials in Loan Workouts”. Available at SSRN: https://ssrn.com/abstract=1743159 or http://dx.doi.org/10.2139/ssrn.1743159

Collins, J. M., Schmeiser, M. D., & Urban, C. (2013). “Protecting minority homeowners: Race, foreclosure counseling and mortgage modifications”. *Journal of Consumer Affairs*, 47(2), 289-310.

Consumer Financial Protection bureau. (Nov. 2020). “Learn about mortgage relief options and protections”. Accessed at: https://www.consumerfinance.gov/coronavirus/mortgage-and-housing-assistance/mortgage-relief/

Cornelissen, Sharon and Hermann, Alexander. (2020). “A Triple Pandemic? The Economic Impacts of COVID-19 Disproportionately Affect Black and Hispanic Households”. *Joint Center for Housing Studies of Harvard University*. Available at: https://www.jchs.harvard.edu/blog/a-triple-pandemic-the-economic-impacts-of-covid-19-disproportionately-affect-black-and-hispanic-households/

DeFusco, Anthony, and John Mondragon. (2020). "No Job, No Money, No Refi: Frictions to Refinancing in a Recession." Journal of Finance 75 (5): 2327-2376.

Duncan, Douglas. (Aug. 2020). “Covid-19: The Need for Consumer Outreach and Home Purchase/Financing Digitization. National Housing Survey. *Fannie Mae*. Accessed at: https://capmrkt.fanniemae.com/resources/file/research/housingsurvey/pdf/covid19-consumer-impact-nhs-q22020.pdf

Farrell, D., Greig, F., Zhao, C. (2020). “Did Forbearance Reach the Right Homeowners?”. *JPMorgan Chase & Co*. Accessed at: https://www.jpmorganchase.com/institute/research/household-debt/report-did-mortgage-forbearance-reach-the-right-homeowners

Federal Housing Finance Agency. (5/19/2020). “FHFA Announces Refinance and Home Purchase Eligibility for Borrowers in Forbearance”. Accessed at: https://www.fhfa.gov/Media/PublicAffairs/Pages/FHFA-Announces-Refinance-and-Home-Purchase-Eligibility-for-Borrowers-in-Forbearance.aspx

Federal Housing Finance Agency. (2020) “House Price Index Datasets”. Accessed at: https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx

Goodman, L., Golding, E. (2021). “A Streamlined Home Refinancing Program Would Lower Monthly Payments and Prevent Defaults”. *Urban Institute*. Accessed at: https://www.urban.org/urban-wire/streamlined-home-refinancing-program-would-lower-monthly-payments-and-prevent-defaults

Hembre, E., Moulton, S., Record M. (2020). “Low-Income Homeownership and the Role of State Subsidies: A Comparative Analysis of Mortgage Outcomes”. *Journal of Policy Analysis and Management*. Accessed at: https://doi-org.proxy.lib.ohio-state.edu/10.1002/pam.22240

Johnson Eric, Stephan Meier, and Olivier Toubia. (2019). "What's the Catch? Suspicion in Bank Motives and Sluggish Refinancing." The Review of Financial Studies 32 (2): 467-495.

Lambie-Hanson, L., & Reid, C. (2018). “Stuck in subprime? Examining the Barriers to Refinancing Mortgage Debt”. *Housing Policy Debate*, 28(5), 770-796.

Lee, S.Y., Park, M., Shin, Y. (2021). “Hit Harder, Recover Slower? Unequal Employment Effects of the Covid-19 Shock”. National Bureau of Economic Research Working Paper 28354. Accessed at: http://www.nber.org/papers/w28354

Parker, K., Menasce Horowitz, J., & Brown, A. April 21, 2020. About Half of Lower-Income Americans Report Household Job or Wage Loss Due to COVID-19. *Pew Research Center*. Accessed at: https://www.pewsocialtrends.org/2020/04/21/about-half-of-lower-income-americans-report-household-job-or-wage-loss-due-to-covid-19/

Rothstein, Richard. “The Color of Law: A Forgotten History of How Our Government Segregated America”. *Liveright*, 2018.

Russell, B. D., Moulton, S., & Greenbaum, R. T. (2014). “Take-up of mortgage assistance for distressed homeowners: The role of geographic accessibility”. Journal of Housing Economics, 24, 57-74.

United States Census Bureau. (2019) “2010 Census Urban and Rural Classification and Urban Area Criteria”. Accessed at: https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural/2010-urban-rural.html

Appendix

Some variables were transformed to make their coefficients in the regressions easier to interpret. All monetary variables are measured by 10 thousand, credit score is by 10 points, and all percentages are by 1 ppt.

Table 2: Relative Risk Ratios of Default in February 2020

	Race b/se	+ Loan Characteristics b/se	+Demographics b/se	+Financial Characteristics b/se
Default				
Asian or Pacific Islander	0.218*	0.196	0.179	0.183
	(-2.14)	(-1.62)	(-1.71)	(-1.68)
Black	1.742***	1.571***	1.597***	1.497***
	(5.56)	(4.36)	(4.12)	(3.52)
Hispanic	0.808	0.797	0.761	0.712
	(-0.72)	(-0.76)	(-0.90)	(-1.11)
Other Race/Ethnicity	1.146	1.280	1.263	1.297
	(0.71)	(1.24)	(1.16)	(1.29)
Annual Interest Rate		1.437**	1.433**	1.457**
		(2.82)	(2.71)	(2.77)
Loan Age		1.027	1.030*	1.030*
		(1.92)	(2.09)	(2.07)
CLTV		1.029***	1.024**	1.023**
		(3.68)	(3.01)	(2.86)
Price of Home		1.007	1.013	1.062***
		(0.55)	(0.97)	(4.01)
Depository or Union		0.781*	0.805	0.858
		(-2.22)	(-1.93)	(-1.35)
Annual Change in Home price		1.025	1.045	0.989
		(0.34)	(0.59)	(-0.15)
DPA		3.112***	3.089***	3.189***

	(3.94)	(3.89)	(3.91)
Closing Year=2016	0.860	0.965	1.155
	(-0.80)	(-0.18)	(0.74)
Closing Year =2017	0.755	0.917	1.111
	(-0.83)	(-0.25)	(0.30)
Closing Year =2018	0.532	0.669	0.793
	(-1.18)	(-0.74)	(-0.42)
Closing Year =2019	0.222*	0.265	0.308
	(-2.21)	(-1.91)	(-1.69)
Closing Year =2020	3.22×10^{-6}	8.34×10^{-7}	5.26×10^{-7}
	(-0.03)	(-0.01)	(-0.01)
Age		1.001	1.001
		(0.28)	(0.13)
Married		0.677***	0.705**
		(-3.44)	(-3.08)
Household Size		1.309***	1.248***
		(5.29)	(4.31)
Female		0.797*	0.766**
		(-2.42)	(-2.80)
Dependents to Employed		1.065	1.061
		(1.10)	(1.03)
Disabled or Elderly		0.745	0.715
		(-1.00)	(-1.11)
Occupation Missing		1.157	1.165
		(0.82)	(0.85)
Essential Worker		0.729*	0.761
		(-2.02)	(-1.73)
Medical Worker		0.865	0.976
		(-0.98)	(-0.16)
Coborrower		0.502***	1.441
		(-4.54)	(0.28)

Percent Urban of County			0.993**	0.994*
			(-3.12)	(-2.51)
Age of Home			1.005**	1.005**
			(3.03)	(2.82)
Household Income				0.820***
				(-5.85)
Credit Score				0.897***
				(-9.72)
Coborrower Credit Score				0.982
				(-1.00)
Observations	16124	15389	15341	15325
Pseudo R^2	0.008	0.063	0.092	0.116

Exponentiated coefficients; *t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Relative Risk Ratios of Mortgage Options June 2020

	(1) Outcome	(2) Outcome	(3) Outcome	(4) Outcome
Default				
Asian or Pacific Islander	0.462	0.572	0.539	0.557
	(-1.32)	(-0.78)	(-0.86)	(-0.81)
Black	1.684***	1.597***	1.643***	1.532**
	(4.19)	(3.66)	(3.56)	(3.05)
Hispanic	0.993	1.018	1.012	0.965
	(-0.02)	(0.05)	(0.03)	(-0.11)
Other Race/Ethnicity	0.938	1.046	1.041	1.057
	(-0.25)	(0.17)	(0.15)	(0.21)
Annual Interest Rate		1.404*	1.397*	1.437*
		(2.23)	(2.15)	(2.29)
Loan Age		1.021	1.028	1.027
		(1.25)	(1.62)	(1.54)
CLTV		1.036***	1.031***	1.030**
		(4.09)	(3.48)	(3.27)
Price of Home		1.027	1.035*	1.077***
		(1.76)	(2.10)	(4.16)
Depository or Union		0.762*	0.781	0.833
		(-2.01)	(-1.81)	(-1.33)
Annual Change in Home price		0.974	1.001	0.949
		(-0.30)	(0.01)	(-0.59)
DPA		2.242**	2.255**	2.255**
		(2.67)	(2.67)	(2.61)
Closing Year=2016		0.751	0.888	1.075
		(-1.27)	(-0.51)	(0.31)
Closing Year =2017		0.566	0.752	0.890
		(-1.40)	(-0.69)	(-0.28)
Closing Year =2018		0.362	0.509	0.578

	(-1.58)	(-1.03)	(-0.83)
Closing Year =2019	0.111**	0.146*	0.160*
	(-2.68)	(-2.29)	(-2.17)
Closing Year =2020	0.000000754	0.000000434	0.000000314
	(-0.02)	(-0.01)	(-0.01)
Age		1.011*	1.010*
		(2.42)	(2.20)
Married		0.653**	0.682**
		(-3.15)	(-2.82)
Household Size		1.306***	1.235***
		(4.41)	(3.46)
Female		0.777*	0.762*
		(-2.23)	(-2.37)
Dependents to Employed		1.051	1.048
		(0.72)	(0.66)
Disabled or Elderly in HH		0.916	0.900
		(-0.31)	(-0.37)
Occupation Missing		1.525*	1.550*
		(2.07)	(2.14)
Essential Worker		0.867	0.918
		(-0.81)	(-0.48)
Medical Worker		0.944	1.046
		(-0.32)	(0.25)
Coborrower		0.662*	2.895
		(-2.48)	(0.83)
Percent Urban of County		0.991**	0.993**
		(-3.18)	(-2.60)
Age of Home		1.006**	1.005**
		(2.96)	(2.77)

Household Income				0.858***
				(-3.85)
Credit Score				0.884***
				(-9.73)
Coborrower Credit Score				0.977
				(-1.27)
Prepay				
Asian or Pacific Islander	0.439	0.346*	0.354*	0.383
	(-1.62)	(-2.06)	(-1.99)	(-1.84)
Black	0.663**	0.643**	0.733	0.749
	(-2.66)	(-2.75)	(-1.84)	(-1.71)
Hispanic	0.567	0.621	0.643	0.663
	(-1.57)	(-1.31)	(-1.21)	(-1.12)
Other Race/Ethnicity	1.103	1.023	1.054	1.080
	(0.49)	(0.11)	(0.26)	(0.38)
Annual Interest Rate		1.823***	1.774***	1.732***
		(4.36)	(4.11)	(3.94)
Loan Age		0.905***	0.904***	0.903***
		(-6.20)	(-6.26)	(-6.29)
CLTV		0.992	0.993	0.992
		(-0.97)	(-0.81)	(-0.89)
Price of Home		1.107***	1.104***	1.082***
		(9.12)	(8.07)	(5.81)
Depository or Union		1.219	1.202	1.182
		(1.76)	(1.62)	(1.47)
Annual Change in Home price		0.880	0.862*	0.876
		(-1.78)	(-2.01)	(-1.78)
DPA		0.521**	0.564**	0.586*
		(-3.16)	(-2.75)	(-2.56)

Closing Year =2016	0.245***	0.224***	0.215***
	(-5.99)	(-6.31)	(-6.45)
Closing Year =2017	0.0591***	0.0535***	0.0511***
	(-6.94)	(-7.13)	(-7.21)
Closing Year =2018	0.00890***	0.00845***	0.00806***
	(-7.39)	(-7.44)	(-7.47)
Closing Year =2019	0.00172***	0.00170***	0.00165***
	(-8.09)	(-8.09)	(-8.10)
Closing Year =2020	3.44e-09	1.69e-09	9.93e-10
	(-0.03)	(-0.02)	(-0.01)
Age		0.972***	0.971***
		(-5.49)	(-5.58)
Married		1.185	1.166
		(1.33)	(1.19)
Household Size		0.834*	0.849*
		(-2.32)	(-2.07)
Female		0.863	0.883
		(-1.47)	(-1.23)
Dependents to Employed		1.060	1.052
		(0.60)	(0.52)
Disabled or Elderly in HH		1.455	1.475
		(1.70)	(1.77)
Occupation Missing		0.668*	0.662*
		(-2.13)	(-2.17)
Essential Worker		0.947	0.942
		(-0.38)	(-0.41)
Medical Worker		0.955	0.893
		(-0.30)	(-0.72)
Coborrower		0.962	1.292
		(-0.29)	(0.21)

Percent Urban of County			1.004	1.003
			(1.41)	(1.14)
Age of Home			0.996*	0.996*
			(-2.16)	(-2.19)
Household Income				1.106**
				(2.88)
Credit Score				1.026*
				(2.29)
Coborrower Credit Score				0.998
				(-0.13)
Forbearance				
Asian or Pacific Islander	0.956	1.248	1.087	1.028
	(-0.22)	(1.03)	(0.38)	(0.13)
Black	2.134***	2.042***	1.890***	1.787***
	(12.96)	(11.74)	(9.69)	(8.75)
Hispanic	1.410*	1.395*	1.215	1.161
	(2.47)	(2.35)	(1.36)	(1.03)
Other Race/Ethnicity	1.212	1.267*	1.215	1.170
	(1.72)	(2.05)	(1.68)	(1.34)
Annual Interest Rate		1.163*	1.168*	1.228**
		(2.12)	(2.14)	(2.78)
Loan Age		1.000	0.998	0.998
		(-0.00)	(-0.28)	(-0.28)
CLTV		1.024***	1.023***	1.021***
		(4.53)	(4.26)	(3.93)
Price of Home		1.022***	1.018*	1.050***
		(3.37)	(2.57)	(6.24)
Depository or Union		0.795***	0.807**	0.836**
		(-3.43)	(-3.20)	(-2.65)

Annual Change in Home price	1.073	1.070	1.027
	(1.60)	(1.52)	(0.60)
DPA	1.465**	1.423**	1.301*
	(3.17)	(2.90)	(2.13)
Closing Year =2016	0.763*	0.752*	0.872
	(-2.16)	(-2.23)	(-1.06)
Closing Year =2017	0.698	0.677	0.772
	(-1.73)	(-1.84)	(-1.21)
Closing Year =2018	0.703	0.673	0.734
	(-1.09)	(-1.21)	(-0.94)
Closing Year =2019	0.623	0.582	0.624
	(-1.19)	(-1.34)	(-1.16)
Closing Year =2020	0.513	0.504	0.541
	(-1.02)	(-1.04)	(-0.93)
Age		0.998	0.997
		(-0.93)	(-1.17)
Married		0.867*	0.890
		(-2.20)	(-1.78)
Household Size		1.188***	1.129***
		(5.37)	(3.73)
Female		0.910	0.882*
		(-1.77)	(-2.33)
Dependents to Employed		1.036	1.043
		(0.93)	(1.09)
Disabled or Elderly		1.026	0.977
		(0.20)	(-0.17)
Occupation Missing		0.892	0.900
		(-1.37)	(-1.24)
Essential Worker		0.873	0.923

			(-1.61)	(-0.94)
Medical Worker			0.913	0.999
			(-1.06)	(-0.01)
Coborrower			0.828*	1.049
			(-2.48)	(0.07)
Percent Urban of County			1.003*	1.004**
			(2.10)	(2.76)
Age of Home			1.001	1.001
			(1.15)	(1.10)
Household Income				0.888***
				(-6.35)
Credit Score				0.913***
				(-13.53)
Coborrower Credit Score				0.995
				(-0.57)
Observations	16124	15389	15341	15325
Pseudo R^2	0.009	0.039	0.052	0.069

Exponentiated coefficients; *t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Relative Risk Ratios of Mortgage Outcomes in February 2021

	(1) Outcome	(2) Outcome	(3) Outcome	(4) Outcome
Default				
Asian or Pacific Islander	0.237*	0.192	0.185	0.179
	(-2.02)	(-1.64)	(-1.67)	(-1.70)
Black	1.210	1.111	1.106	1.042
	(1.51)	(0.81)	(0.73)	(0.30)
Hispanic	1.179	1.201	1.138	1.074
	(0.61)	(0.67)	(0.47)	(0.26)
Other Race/Ethnicity	0.918	1.014	1.009	1.008
	(-0.37)	(0.06)	(0.04)	(0.03)
Annual Interest Rate		1.315*	1.280	1.313
		(1.98)	(1.76)	(1.92)
Loan Age		0.915***	0.913***	0.913***
		(-5.88)	(-5.89)	(-5.90)
CLTV		1.033***	1.030**	1.028**
		(3.61)	(3.20)	(2.96)
Price of Home		1.022	1.024	1.068***
		(1.56)	(1.54)	(3.96)
Depository or Union		0.628***	0.622***	0.657**
		(-3.43)	(-3.45)	(-3.05)
Annual Change in Home price		1.020	1.034	0.981
		(0.23)	(0.39)	(-0.22)
DPA		2.479***	2.488***	2.410**
		(3.30)	(3.31)	(3.16)
Closing Year=2016		0.285***	0.296***	0.354***
		(-5.83)	(-5.53)	(-4.68)
Closing Year=2017		0.0595***	0.0638***	0.0765***
		(-7.45)	(-7.15)	(-6.65)
Closing Year=2018		0.0120***	0.0127***	0.0148***

	(-7.45)	(-7.26)	(-6.99)
Closing Year=2019	0.00190***	0.00188***	0.00213***
	(-8.47)	(-8.36)	(-8.17)
Closing Year=2020	7.29e-09	3.19e-09	2.02e-08
	(-0.04)	(-0.02)	(-0.05)
Age		1.002	1.001
		(0.44)	(0.30)
Married		0.642***	0.664**
		(-3.43)	(-3.17)
Household Size		1.225***	1.160*
		(3.39)	(2.45)
Female		0.856	0.822
		(-1.49)	(-1.86)
Dependents to Employed		1.060	1.067
		(0.83)	(0.92)
Disabled or Elderly in HH		0.893	0.866
		(-0.36)	(-0.46)
Occupation Missing		1.010	1.023
		(0.05)	(0.12)
Essential Worker		0.777	0.813
		(-1.51)	(-1.23)
Medical Worker		0.724	0.815
		(-1.86)	(-1.17)
Coborrower		0.702*	3.136
		(-2.26)	(0.88)
Percent Urban of County		0.995	0.997
		(-1.79)	(-1.30)
Age of Home		1.002	1.002
		(1.05)	(1.02)

Household Income				0.838***
				(-4.68)
Credit Score				0.899***
				(-8.84)
Coborrower Credit Score				0.976
				(-1.30)
Prepay				
Asian or Pacific Islander	0.671	0.323***	0.314***	0.339***
	(-1.80)	(-4.03)	(-4.04)	(-3.73)
Black	0.585***	0.528***	0.570***	0.573***
	(-6.09)	(-6.10)	(-5.10)	(-5.00)
Hispanic	0.600**	0.596*	0.595*	0.611*
	(-2.68)	(-2.32)	(-2.29)	(-2.14)
Other Race/Ethnicity	0.916	0.812	0.835	0.866
	(-0.74)	(-1.44)	(-1.24)	(-0.98)
Annual Interest Rate		2.264***	2.141***	2.082***
		(8.79)	(8.04)	(7.73)
Loan Age		0.645***	0.645***	0.644***
		(-40.72)	(-40.36)	(-40.21)
CLTV		0.989	0.992	0.991
		(-1.78)	(-1.29)	(-1.48)
Price of Home		1.093***	1.084***	1.057***
		(11.61)	(9.52)	(5.92)
Depository or Union		1.223**	1.190*	1.168
		(2.58)	(2.19)	(1.95)
Annual Change in Home price		0.905*	0.888*	0.906
		(-1.96)	(-2.29)	(-1.88)
DPA		0.473***	0.515***	0.545***
		(-5.28)	(-4.61)	(-4.18)

Closing Year=2016	0.00920***	0.00847***	0.00803***
	(-28.02)	(-28.07)	(-28.18)
Closing Year=2017	0.0000341***	0.0000322***	0.0000303***
	(-36.23)	(-35.94)	(-35.88)
Closing Year=2018	6.52e-08***	6.73e-08***	6.28e-08***
	(-37.88)	(-37.40)	(-37.26)
Closing Year=2019	6.89e-10***	7.79e-10***	7.36e-10***
	(-39.49)	(-38.95)	(-38.76)
Closing Year=2020	2.62e-11***	3.71e-11***	3.47e-11***
	(-20.68)	(-20.40)	(-20.42)
Age		0.979***	0.978***
		(-6.78)	(-6.99)
Married		1.196*	1.184*
		(2.10)	(1.97)
Household Size		0.820***	0.840***
		(-3.90)	(-3.38)
Female		0.920	0.957
		(-1.26)	(-0.66)
Dependents to Employed		1.092	1.077
		(1.38)	(1.16)
Disabled or Elderly in HH		1.262	1.281
		(1.43)	(1.53)
Occupation Missing		0.565***	0.559***
		(-5.17)	(-5.24)
Essential Worker		0.930	0.927
		(-0.75)	(-0.78)
Medical Worker		0.822	0.752**
		(-1.81)	(-2.60)
Coborrower		1.230*	3.572
		(2.28)	(1.78)

Percent Urban of County			1.006**	1.005**
			(3.00)	(2.61)
Age of Home			0.994***	0.994***
			(-4.56)	(-4.67)
Household Income				1.137***
				(5.45)
Credit Score				1.033***
				(4.30)
Coborrower Credit Score				0.988
				(-1.26)
Forbearance				
Asian or Pacific Islander	0.587*	0.748	0.669	0.641
	(-2.21)	(-1.09)	(-1.50)	(-1.64)
Black	1.941***	1.842***	1.788***	1.689***
	(11.26)	(9.94)	(8.69)	(7.76)
Hispanic	1.209	1.199	1.055	1.009
	(1.31)	(1.23)	(0.36)	(0.06)
Other Race/Ethnicity	0.912	0.997	0.967	0.940
	(-0.75)	(-0.03)	(-0.27)	(-0.48)
Annual Interest Rate		1.015	1.037	1.080
		(0.22)	(0.53)	(1.10)
Loan Age		0.998	0.997	0.996
		(-0.22)	(-0.40)	(-0.47)
CLTV		1.037***	1.034***	1.032***
		(6.56)	(6.00)	(5.54)
Price of Home		1.018**	1.015*	1.045***
		(2.62)	(1.97)	(5.43)
Depository or Union		0.869*	0.883	0.916
		(-2.12)	(-1.87)	(-1.31)
Annual Change in Home		1.120*	1.125*	1.076

price			
	(2.46)	(2.52)	(1.58)
DPA	1.876***	1.805***	1.683***
	(5.22)	(4.85)	(4.21)
Closing Year=2016	0.746*	0.758*	0.886
	(-2.31)	(-2.13)	(-0.92)
Closing Year=2017	0.782	0.789	0.907
	(-1.21)	(-1.14)	(-0.47)
Closing Year=2018	0.829	0.823	0.902
	(-0.60)	(-0.61)	(-0.32)
Closing Year=2019	0.657	0.642	0.693
	(-1.09)	(-1.13)	(-0.93)
Closing Year=2020	0.487	0.495	0.538
	(-1.11)	(-1.08)	(-0.94)
Age		0.992**	0.992***
		(-3.25)	(-3.51)
Married		0.892	0.918
		(-1.75)	(-1.29)
Household Size		1.232***	1.170***
		(6.53)	(4.84)
Female		0.940	0.911
		(-1.13)	(-1.69)
Dependents to Employed		1.042	1.049
		(1.08)	(1.26)
Disabled or Elderly in HH		1.199	1.153
		(1.39)	(1.05)
Occupation Missing		0.950	0.959
		(-0.61)	(-0.49)
Essential Worker		0.883	0.941
		(-1.46)	(-0.71)

Medical Worker			0.907	0.991
			(-1.12)	(-0.10)
Coborrower			0.730***	1.492
			(-3.98)	(0.56)
Percent Urban of County			1.000	1.001
			(0.16)	(0.85)
Age of Home			1.002*	1.002*
			(2.44)	(2.43)
Household Income				0.894***
				(-5.91)
Credit Score				0.908***
				(-13.90)
Coborrower Credit Score				0.988
				(-1.20)
Observations	16124	15389	15341	15325
Pseudo R^2	0.008	0.146	0.160	0.175

Exponentiated coefficients; *t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$